Sierra
125 B
126 A
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INSTRUCTION MANUAL

FREQUENCY SELECTIVE VOLTMETER

MODEL 125B

PHILCO
A SUBSIDIARY OF Ford Motor Company

SIERRA ELECTRONIC DIV.
3885 BOHANNON DR., MENLO PARK, CALIFORNIA

Stock No. 950000006

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This warranty does not apply to any of our products which have been repaired, worked upon or altered by persons not authorized by us so as, in our sole judgment, to injure the stability or reliability of such instrument, or which have been subject to misuse, negligence or accident, or the serial number of which has been altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, used or adjusted otherwise than in accordance with the instructions furnished by us. Nor does SIERRA ELECTRONIC DIVISION, PHILCO CORPORATION assume any liability for consequential damages, and in any event our liability shall in no case exceed the original purchase price of the instrument. Accessories, including but not limited to all vacuum tubes, fuses and batteries, not of our manufacture used with this product are not covered by this warranty.

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Manufactured by

PHILCO
A SUBSIDIARY OF Ford Motor Company

sierra
SIERRA ELECTRONIC DIV.
3885 BOHANNON DR., MENLO PARK, CALIFORNIA

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NOTICE

WITH THE VOLTMETER CALIBRATED AND OPERATING NORMALLY, INTERNALLY GENERATED NOISE WILL DEFLECT THE METER SLIGHTLY UPSCALE. THIS NOISE SHOULD NOT EXCEED THE -20 DB MARK ON THE METER AND DOES NOT AFFECT THE MEASURING ACCURACY OVER THE SPECIFIED RANGE.

SECTION I
DESCRIPTION AND OPERATING INSTRUCTIONS

1. INTRODUCTION.

a. This handbook describes the Model 125B Frequency Selective Voltmeter and its variations, Models 125B-CR and 125B-Y, manufactured by Sierra Electronic Div., Menlo Park, California. Information contained in this handbook will enable the technician to perform operation, calibration and field maintenance procedures consistent with practices and recommendations of the manufacturer. Model 125B is illustrated in figure 1-1. Full specifications are given in table 1-1.

TABLE 1-1. SPECIFICATIONS, MODELS 125B, 125B-CR, 125B-Y

FREQUENCY RANGE:	
Selective Voltmeter	
Wide band (2500 cps)	10 kc to 620 kc
Narrow band (250 cps)	3 kc to 620 kc
Flat Voltmeter	1 kc to 620 kc
INPUT LEVEL RANGE:	
Selective Voltmeter	-90 dbm to +32 dbm (24.5 microvolts to 30 volts)
Flat Voltmeter	-30 dbm to +32 dbm (24.5 millivolts to 30 volts)
MEASUREMENT ACCURACY:	
Selective Voltmeter	±1 db (-80 dbm to +32 dbm)
Flat Voltmeter	±0.5 db (20 dbm to +32 dbm)
SELECTIVE VOLTMETER BAND-PASS:	
Wide band (2500 cps)	2500 cps (±1.25 kc) 3 db down 6000 cps (±3 kc) 30 db down 14,000 cps (±7 kc) 60 db down
Narrow band (250 cps)	250 cps (±125 cps) 3 db down 600 cps (±300 cps) 30 db down 1400 cps (±700 cps) 60 db down
DIRECT READING:	Dbm with 135 ohm and 600 ohm balanced or unbalanced lines. Volts with 600 ohm balanced or unbalanced lines.
INPUT IMPEDANCE:	
600 ohm position	20,000 ohms nominal
135 ohm position	4500 ohms nominal
*WE IN position	4500 ohms nominal
*EW IN position	4500 ohms nominal
*EW OUT position	4500 ohms nominal
*GR IN position	4500 ohms nominal
*GR OUT position	4500 ohms nominal

*Model 125B-Y only

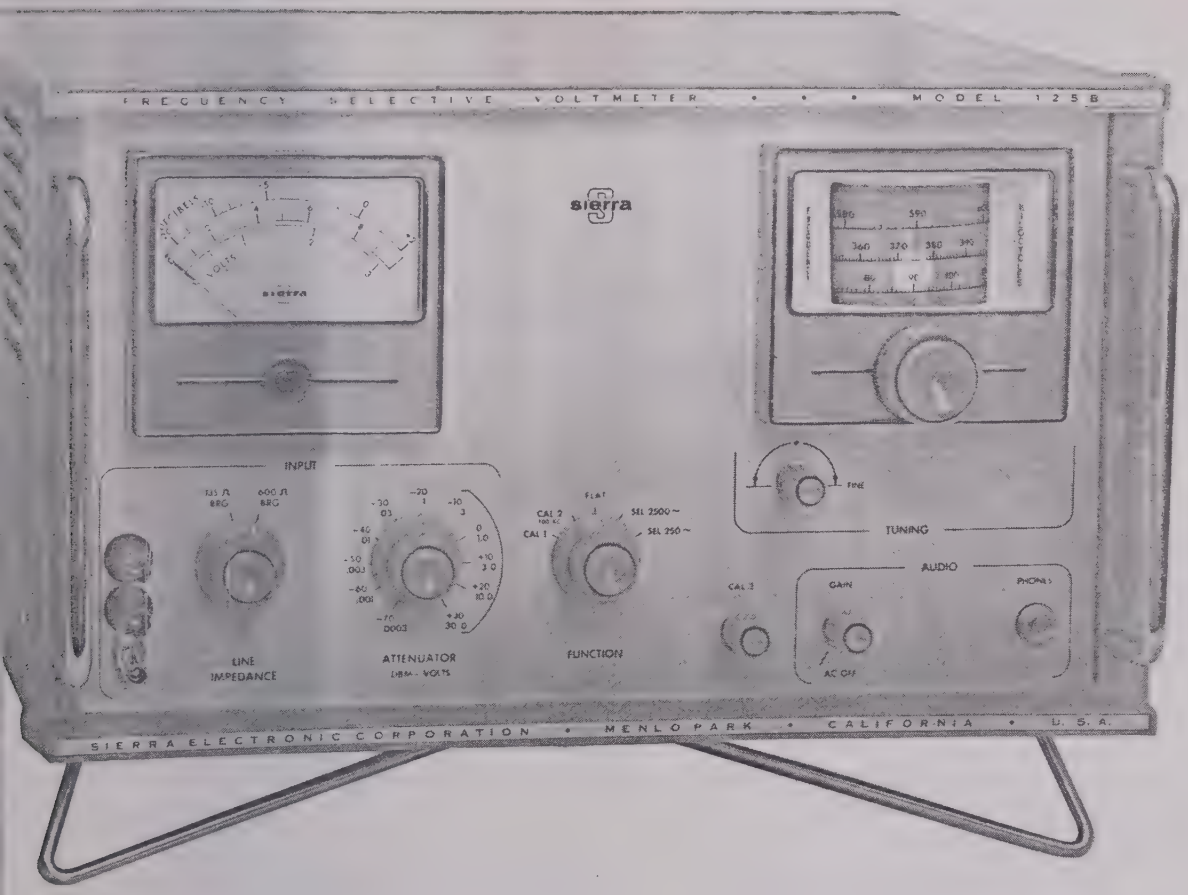

Figure 1-1. Model 125B

TABLE 1-1 (Continued)

LINE BRIDGING LOSS:	Less than 0.3 db over entire frequency range, either input impedance.
TUNING ACCURACY:	
Room Temp.	±1 kc over entire tuning range
50° F to 120° F	±2 kc over entire tuning range
SPURIOUS RESPONSE:	
Harmonic Distortion	Greater than 60 db down
Intermodulation Distortion	Greater than 60 db down
Image Response	Greater than 50 db down
Direct I-F Response	Greater than 50 db down
CALIBRATION OSCILLATOR:	100 kc ±0.02%
*CARRIER REINSERTION OSCILLATORS:	
Lower Sideband	2.2135 mc ±0.005%
Upper Sideband	2.2165 mc ±0.005%
POWER INPUT:	105/125 volts, 50-1000 cps 60 watts
OVERALL DIMENSIONS:	
Width	17 inches
Height	10 1/8 inches
Depth	14 1/4 inches
WEIGHT:	30 lbs.
AMBIENT TEMPERATURE RANGE:	50° F to 120° F

*Model 125B-CR only

2. DESCRIPTION.

a. FREQUENCY SELECTIVE VOLTMETER. As a frequency selective voltmeter, Model 125B tunes from 3 kc to 620 kc with a sensitivity variable from 24.5 microvolts to 30 volts (-90 dbm to +32 dbm) in eleven attenuator steps. Transmission lines of 600 ohms and 135 ohms impedance may be matched by use of the LINE IMPEDANCE panel control which selects the proper internal bridging circuit. Output of the instrument is read directly in dbm by algebraically adding the reading on ATTENUATOR panel control to the output meter reading. Direct voltage readings may be made in 600-ohm position.

b. SELECTIVITY. Two crystal filters located between the mixer stages and the i-f amplifier provide bandwidth of 2500 cycles and 250 cycles in frequency selective operation. Selected with the panel control marked FUNCTION, these two selectivity characteristics make the Model 125B useful for complex waveform analysis as well as for general carrier system measurements.

c. FLAT VOLTMETER. In addition to its frequency selective capability, Model 125B has been designed to operate as a flat a-c VTVM with response essentially flat from 1 kc to 620 kc. In this mode of operation, a portion of the attenuator deck is by-passed so that the gain lost in switching the input signal around the mixer and i-f amplifier (approximately 60 db) is recovered by using only a portion of the input attenuation. Five attenuator steps are therefore available for flat voltmeter measurements. Range of sensitivity of Model 125B when used as a flat voltmeter is from 24.5 millivolts to 30 volts (-30 dbm to +32 dbm).

d. MODEL 125B-Y VARIATION. Sierra Model 125B-Y differs from the standard Model 125B only in that it is supplied with a front-panel 20-pin connector and an associated multi-position input selector switch to facilitate connection of a greater number of 135-ohm balanced input circuits to the voltmeter. Model 125B-Y, shown in figure 1-2, is particularly designed for compatibility with built-in maintenance facilities of certain carrier equipment installations.

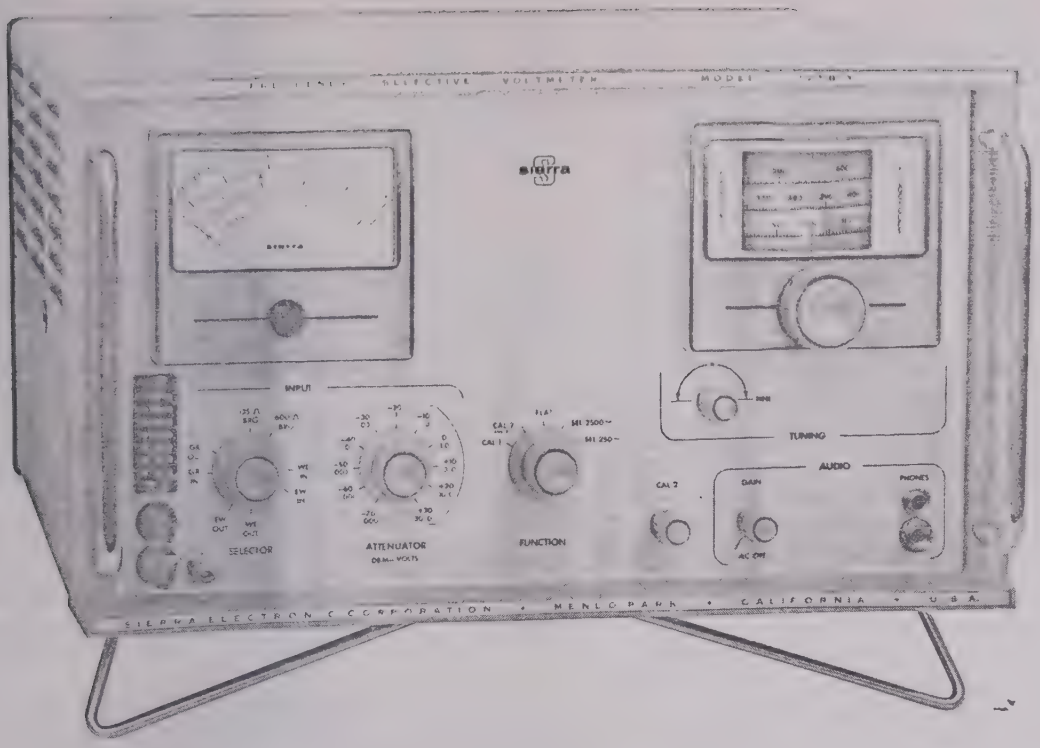

Figure 1-2. Model 125B-Y

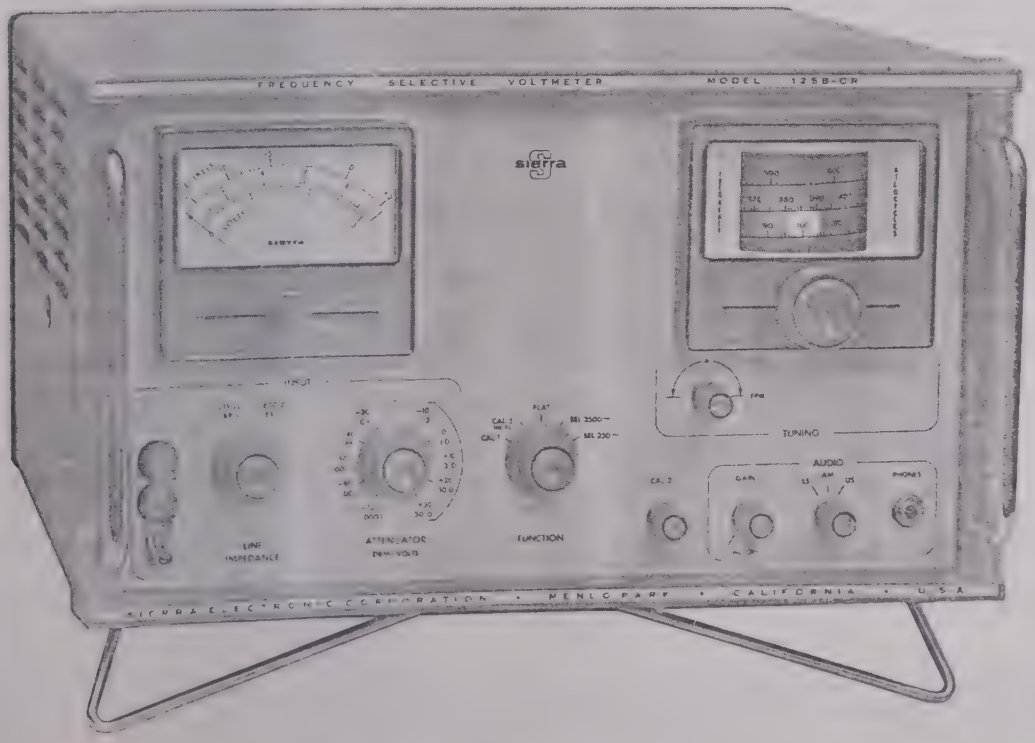

Figure 1-3. Model 125B-CR

e. MODEL 125B-CR VARIATION. Sierra Model 125B-CR differs from the standard Model 125B only in that it is supplied with additional internally mounted oscillators for carrier reinsertion so that Model 125B-CR may be used for monitoring single side band carrier systems. Model 125B-CR is illustrated in figure 1-3.

f. POWER REQUIREMENTS. A power source providing 105 to 125 volts, 50/60 cycles is required. Power consumption is 60 watts. The line cord supplied with the 125B has a standard NEMA three-prong grounded plug.

g. PHYSICAL CHARACTERISTICS. Model 125B is supplied from the manufacturer in either a standard metal cabinet 17 inches wide, 10 1/8 inches high, and 14 1/4 inches deep, or in 19-inch rack panel configuration measuring 19 inches wide, 12 7/32 inches high, and 12 1/4 inches deep. Weight of either instrument is about 30 pounds. All operating controls are mounted on the front panel.

h. GENERAL CONSTRUCTION. Modular printed circuits have been used in the voltmeter to provide direct paths and facilitate maintenance procedures. Components of each circuit are laid out on glass epoxy boards which in turn are mounted to the main chassis. Stand-offs are used to mount the circuit boards, increasing component reliability through improved cooling. Mechanical and electrical components of the local oscillator are mounted on a separate casting to maintain physical alignment and minimize variations due to temperature change and mechanical shock. The tuning drive and dial are integral components of this assembly.

3. PREPARATION.

a. When shipped from the manufacturer, Model 125B is packed in a cardboard shipping carton with suitable packing and re-inforcement to avoid shipping damage. To prepare instrument for use, remove the voltmeter from its shipping carton and inspect for damage. The instrument is shipped with tubes mounted; check to ascertain that all tubes are properly seated in their sockets. Prior to operating the voltmeter, a warm-up period of fifteen minutes is required to stabilize the circuitry. Power is applied by means of the line switch mounted on the audio GAIN panel control. The frequency dial light indicates power ON. Operating controls are listed in table 1-2.

TABLE 1-2. OPERATING CONTROLS

DESIGNATION	FUNCTION
AC OFF, GAIN	A-C power and AUDIO GAIN control.
PHONES	Headphone jack.
TUNING	Main tuning control (two-speed, in-out positioning).
FINE	Fine tuning control.
FUNCTION	Selects proper mode of operation (CAL 1, CAL 2, FLAT, SEL 2500~, SEL 250~).
ATTENUATOR	Calibrated selector reading amount of attenuation in db, and voltage range in volts (600Ω BRG position only).
LINE IMPEDANCE	Selects 135Ω BRG or 600Ω BRG input impedance.
INPUT BINDING POSTS	Provide means of accepting balanced or unbalanced input signals.
LS-AM-US	(On Model 125B-CR only) Selects lower sideband, upper sideband or a-m mode of operation.
SELECTOR	(On Model 125B-Y only) Replaces LINE IMPEDANCE selector, and selects eight inputs designated as follows: 135Ω BRG, 600Ω BRG, WE IN, EW IN, WE OUT, EW OUT, GR IN, GR OUT.
CAL 2	Selective Voltmeter GAIN control.

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graphs 4a to 6b

PERATIONAL CALIBRATION.

Model 125 is calibrated for operation he internal 100-kc oscillator. The output his oscillator, when FUNCTION switch S3 AL 1 position, feeds a low distortion 100- nal to the input circuit, the amplitude of s adjusted at R87 (see calibration of injec- cillator, section III, paragraph 1-j) to give reading on the output meter. This estab- a reference level, utilizing the inherent cy and stability of the flat voltmeter, for termination of mixer i-f gain. Procedure ibration follows:

(1) Allow fifteen-minute warmup.

(2) Set ATTENUATOR at 0 db.

(3) Set FUNCTION at CAL 1. Output should read 0 dbm. If it does not, adjust of the injection oscillator with R87 (see h III, paragraph 1-j).

(4) Set FUNCTION at CAL 2.

(5) Adjust tuning dial for maximum out- eter response at 100 kc. Tune carefully in rive position (tuning knob pushed in) and ith panel mounted FINE tuning control.

(6) If necessary, adjust CAL 2 panel l so that output meter reads 0 dbm. In- ent is now properly adjusted for measure- f external signals.

XTERNAL SOURCE CALIBRATION.

It may be desired to use an external os- r for calibration of the voltmeter at a ic frequency in order to obtain the greatest le accuracy. Procedure for external source ation is given below:

(1) Set up a stable, accurately calibrated gnal generator with 600-ohm output, a 600- ttenuator, and a 600-ohm termination, pre- y in the form of an indicating thermocouple. expense of some accuracy, a non-inductive or and a VTVM may be used.

(2) At the desired calibration frequency, ish a signal generator level of 0 dbm (0.775 across the terminating resistance).

(3) Apply established 0 dbm power level voltmeter input terminals.

(4) Set LINE IMPEDANCE at 600Ω BRG.

(5) Set FUNCTION at either SEL 2500 ~ or SEL 250 ~.

(6) Set voltmeter ATTENUATOR at 0 db.

(7) Adjust tuning dial and FINE panel control for maximum indication on the output meter.

(8) Adjust CAL 2 panel control for output meter reading of 0 db.

b. External source calibration for 135-ohm circuits may be accomplished in the manner described for 600-ohm measurements, substituting 135-ohm components in the external test circuits, and with LINE IMPEDANCE selector at 135Ω BRG. Voltage across the 135-ohm termination should be 0.367 volts.

6. GENERAL MEASUREMENT.

a. General circuit measurement procedure is detailed in the steps which follow:

(1) Calibrate voltmeter using either procedure indicated above. (See paragraph 4 or 5.)

(2) Select mode of operation with FUNCTION switch. (FLAT, SEL 2500 ~ or SEL 250 ~.)

(3) Connect signal for measurement to voltmeter input terminals.

(4) Adjust tuning dial for maximum indication on output meter.

(5) Peak output meter with FINE tuning panel control.

(6) Set ATTENUATOR switch as required to obtain an on-scale reading.

(7) To obtain signal magnitude in dbm, add ATTENUATOR reading algebraically to that of the output meter.

b. HEADPHONE MONITORING. In the SEL 2500 ~ position, a headphone of any impedance with single plug may be used to continuously monitor audio signals. A panel control, GAIN, is provided to set the audio at a comfortable listening level. Output is taken from the panel jack designated PHONES.

SECTION II
THEORY OF OPERATION

1. THEORY OF OPERATION.

a. INPUT CIRCUITS. Input circuitry of the voltmeter consists primarily of switch S1 and transformer T1, the low-pass filter, the attenuation network, and switch S2 which selects the desired leg of the attenuator circuitry.

b. An input signal of 600-ohms or 135-ohms impedance applied to panel binding posts J1 and J2 is matched by LINE IMPEDANCE switch S1 to the input of the voltmeter in conjunction with bridging transformer T1, and with C1, R1 and R2. Shielded cabling carries the input signal to a two-section low-pass filter comprised of inductors L1, L2, and of capacitors C2, C3 and C4. The cut-off frequency of this filter is 620 kc. Rejection is approximately 20 db at 1100 kc.

c. ATTENUATOR switch S2, to which the output of the low-pass filter is applied, selects the portion of the attenuator network which corresponds to the panel marking in 10-db steps from -70 db to +30 db. Output of S2 is applied to FUNCTION selector S3.

d. In CAL 1 position, S3 feeds a 100-kc signal from the injection oscillator directly to the flat voltmeter. In CAL 2 position, the 100-kc signal is fed through a portion of the attenuator network (0-db position), through the mixer and crystal filter, FL1, to the i-f amplifier, and then to the flat voltmeter. The input signal is applied directly to the flat voltmeter in FLAT position of the FUNCTION switch, and to the mixer input in SEL 2500 ~ and SEL 250 ~ positions.

e. MIXER AND MODULATOR. Mixer V1 is essentially an amplifier, the gain of which is controlled at a rate which is equal to the local oscillator frequency (2.218 mc to 2.835 mc). The balanced modulator, consisting of CR4, CR5, CR6 and their associated components, acts as a switch which returns the cathode of V1 to a-c ground through R26 and C70. During half of the input cycle to the modulator, the balanced diodes conduct, and the modulator output is seen by C70 to be at a-c ground potential. Capacitor C70 bypasses cathode resistor R27 allowing V1 to function as an amplifier whose gain is on the order of 20 db, with R26 providing the cathode bias. During the other half of the input cycle, the diodes are non-conducting, and the modulator output is seen as a high impedance by C70. This places R27 in the cathode circuit of V1, biasing it to the point that gain through the mixer stage is about unity. Therefore, because the r-f voltage component from the local oscillator has been balanced out in the modulator, there are high order components in the mixer whose frequencies are the sum and difference of the input signal and the local oscillator signal, but essentially no r-f voltage appears in the mixer (local oscillator signal is down 35 db to 50 db at modulator output). Therefore, the local oscillator may be tuned within 3 kc of the i-f frequency without feeding through the mixer i-f section where it would otherwise appear as a spurious signal giving an erroneous indication on the output meter. The plate tank of the mixer is tuned to the difference frequency (2.215 mc) of the mixed components. The signal is then fed through the cathode follower V2 to crystal filter FL1 or FL2.

f. LOCAL OSCILLATOR. The local oscillator, V10, which provides the switching signal for the balanced modulator, tunes from 2.218 mc to 2.835 mc, providing an intermediate frequency of 2.215 mc when mixed with 3-kc to 620-kc input signals. The circuit is a highly stable, temperature compensated Hartley oscillator, transformer coupled to the modulator. Frequency determining components are the tapped variable inductance, L11, and parallel capacitors C62, C63, C64, C65 and C93. The tuning drive mechanism is connected to the shaft of C62, the main tuning capacitor. Capacitor C65 is a compensating capacitor, providing negative temperature coefficient compensation. C93 is the fine-tuning panel control, an eccentric disc (rotor) which electrically loads and unloads a tab (stator) on the main tuning capacitor C62 for minute changes in frequency. Because C93 will rotate 360 degrees, to avoid tuning error, the fine-tuning control should be used over only 180 degrees as marked on the panel. Inductor L11 and capacitor C63 are tracking adjustments for alignment purposes. Local oscillator output is fed to cathode follower, V10B, for isolation and impedance matching.

g. CRYSTAL FILTERS. Two selectivity positions are available in selective frequency operation using crystal filters with center frequencies of 2.215 mc, and bandwidths of 2500

and 250 cycles. The output impedance of thode follower, V2, is about 4000 ohms, ng the input of the crystal filters. Wafers d S3d switch the input and output of the d filter, to feed (SEL 2500 ~ , SEL 250 ~ AL 2) or by-pass (FLAT and CAL 1) the i-f ier. The resistive T-pad network formed istors R38 through R43 provides a means ching the filters to the i-f amplifier, and of ing the filter outputs, with R42, to provide s of equal amplitude for the i-f amplifier. of the T-pad is applied to the grid of V3.

I-F AMPLIFIER. The amplifier is com— of two r-c coupled pentode stages, V3 and ich provide a combined gain of about 45 db. e tuned grid is used to decrease the number d circuit elements susceptible to tempera- ain instability. CAL 2 gain control R55 es a means of varying the i-f gain through e of at least 3 dbm either side of the nomi- in. Output of the i-f amplifier is applied to id of V5, the first flat voltmeter stage, h S3b.

FLAT VOLTMETER OPERATION. Three upled pentode stages and an associated out- eter constitute the wide band flat voltmeter n. This amplifier has a gain of about 35 db, orating approximately 20 db of feedback to e gain stability. Output meter readings are within 0.1 db for a line voltage change of r cent, and for variations in tube g_m up to cent.

Output from the last i-f stage, V4, is d through S3b (in CAL 2, SEL 2500 ~ and 50 ~ positions) to the grid of V5, the input ier stage of the flat voltmeter. Coupling tor C36 is a relatively small value (1000 pf) conjunction with R62, provides a smooth f in response below 1 kc. High frequency f is controlled by capacitors C43 and C35 R71, R72 and R59. The signal is further ied in V6, and coupled to V7. Output of the stage amplifier is applied to the full-wave h diode bridge. Output meter M1 is con- across the bridge, and d-c current through e milliampere movement is proportional to erage a-c voltage applied to the bridge.

In the CAL 1 and FLAT positions of the TION selector switch S3, signals other than mc are applied to the flat voltmeter. In 1, the 100-kc signal from the injection os- r is used to calibrate the voltmeter as a nce against which the gain through the mixer-i-f section is set. When S3 is in position, signals from 1 kc to 620 kc may to the voltmeter. In CAL 2, SEL 2500 ~ , EL 250 ~ , the input signal is first applied to the mixer i-f section, so that the signal reaching the flat voltmeter is 2.215 mc, the i-f output frequency.

l. AUDIO AMPLIFIER. A portion of the output of the last flat voltmeter stage is coupled from a plate resistive dividing network to the audio amplifier stage. The audio component of the signal thus applied is detected by a simple crystal diode demodulator comprised of CR3, R129 or R116 and R117, L6, R74 and C47. The GAIN control, R82, determines the input level. The amplifier itself is a two-stage, twin-triode, r-c coupled circuit, the output of which is terminated at the panel mounted PHONES jack.

m. INJECTION OSCILLATOR. To provide a self-calibration capability, Model 125B includes an internally mounted 100-kc signal source which is applied in CAL 1 position of the function selector switch through the input filter and attenuator to the flat voltmeter, and in CAL 2, to the mixer i-f section. The temperature compensated 100-kc oscillator is a modified crystal-controlled Pierce circuit which generates a signal of constant amplitude. Frequency accuracy is 0.02 per cent over the specified temperature range. This signal, in addition to being used to calibrate flat voltmeter and mixer i-f levels, is also used for checking oscillator tracking and tuning dial accuracy using the high order harmonics generated at 200, 300, 400, 500 and 600 kc as reference signals. Output level is controlled with screwdriver adjusted potentiometer, R87.

n. POWER SUPPLY. The power supply for Model 125B is comprised of a full-wave silicon diode bridge rectifier, a series regulator, V11, and a twin triode cascade amplifier, V12. Voltage reference tube, V13, holds the grid of V12B at a constant value, thus a decrease in output voltage allows V12B to conduct more heavily because of the apparent, or relative, increase in grid voltage. The plate of V12B then becomes more negative because of the increased drop across R110, and the grid of V12A becomes more negative, decreasing the current through that stage, and increasing its plate voltage. Being directly connected to the plate of V12A, the grid of V11 will become more positive. The resulting decrease in voltage dropped across V11 will restore the original output voltage. D-c drift due to the effect of filament voltage changes in V13 is cancelled by differential action between the two sections of V12. Voltage adjustment potentiometer R113 establishes the operating level of the series regulator, and consequently the output voltage. Supply voltage is maintained at 225 volts, with regulation better than 0.25 per cent over a line voltage variation of 105 to 125 volts. Ripple amplitude is less than one millivolt. Input transi-

ent protection is provided with an r-c bridging network in the primary of T3.

o. MODEL 125B-CR. For measurement of single-sideband signals, the manufacturer has provided an instrument variation designated Model 125B-CR. This model includes in its circuitry, two crystal-controlled carrier reinsertion oscillators and a cathode follower. One triode oscillator, for lower sideband reception, operates at 1.5 kc below the i-f frequency. For upper sideband reception, the second oscillator operates at 1.5 kc above the i-f frequency. One of these two signals is applied as required through the cathode-follower stage to the diode demodulator at the input of the audio amplifier where it is combined with the carrier-suppressed sideband signal from the output of the flat amplifier. The reinserted carrier from the internal oscillator provides an r-f base against which sideband signals beat, forming a combined signal which is reduced to its audio component at the demodulator. LS-AM-US switch, S5, selects the proper oscillator, and applies plate voltage for its operation. All three triode stages of the circuit are combined in a single envelope, V14.

p. MODEL 125B-Y. Basic operation of Model 125B-Y is identical to that of the standard Model 125B. The input selector S1, however, has been expanded in the number of selectable inputs made available through front-panel switching, to accommodate connection to long-line telephone systems. A 20-pin connector is mounted on the front panel, as shown in figure 1-2, through which permanent or semi-permanent installation of input information may be made.

SECTION III
CALIBRATION AND MAINTENANCE

1. CALIBRATION.

a. GENERAL. Calibration procedures described in this section may be conducted independently. For complete calibration to manufacturer's recommended specifications, each unit of the voltmeter should be calibrated in the sequence presented in this section. Adjustment difficulties may indicate circuit malfunction. Refer to paragraph 2 for trouble-shooting information.

b. POWER SUPPLY ADJUSTMENT. Using a d-c vacuum tube voltmeter, perform the following steps:

(1) Connect the d-c VTVM between TP1 and chassis ground.

(2) Adjust R113 for an output voltage of 225 volts.

(3) Vary line voltage from 105 to 125 volts; there should be no change in output voltage in excess of 0.25 percent.

(4) Using an a-c VTVM and short, shielded connections, observe ripple and noise components; they should not exceed 1.0 millivolt over a line voltage variation of 105 to 125 volts. Whenever noise and ripple are less than 1.0 millivolt combined, regulation will be within specification.

c. INPUT CIRCUIT. Check the input circuit and attenuator in the following manner.

(1) Connect an r-f signal generator providing a 100-kc, 0-db signal to the voltmeter input terminals.

(2) Connect binding posts for balanced input.

(3) Set ATTENUATOR at -70 db.

(4) Set LINE IMPEDANCE at 600⍓BRG.

(5) Set FUNCTION at SEL 2500~.

(6) Remove oscillator tube, V10.

(7) With signal generator tuned to 100-kc at 0-db level, measure from output of ATTENUATOR switch, S2, to ground using an a-c VTVM. Voltage should be -16 dbm.

(8) Set LINE IMPEDANCE to 135⍓BRG: a-c voltage should be -10 dbm.

(9) Change input binding posts from balanced to unbalanced input.

(10) Repeat steps (1) through (8).

(11) Replace oscillator tube V10.

d. FLAT VOLTMETER ADJUSTMENT. Allow fifteen minutes for warmup. When circuits have stabilized, proceed using the method described below:

(1) Set LINE IMPEDANCE at 600⍓BRG.

(2) Set FUNCTION to FLAT.

(3) Set ATTENUATOR at 0 db.

(4) Connect a low distortion r-f signal generator to the input binding posts.

(5) Calibrate signal generator for 0-db output at 100 kc.

(6) Adjust amplifier gain at R71 for an output meter reading of 0 dbm.

(7) Tune signal generator successively to 1 kc, 3 kc, 10 kc, 50 kc, 200 kc, 300 kc, 400 kc, 500 kc and 620 kc at 0-db level, and record output meter reading for each frequency. Variation should be less than 0.5 db from 3 kc to 620 kc and less than 0.7 db from 1 kc to 620 kc.

(8) Repeat step (7) with LINE IMPEDANCE in 135Ω BRG position.

e. Output meter linearity determination requires an attenuator of 600 ohms impedance and an r-f signal generator. Procedure is indicated below:

(1) Apply a 100-kc, 0-db signal to voltmeter binding posts through external attenuator.

(2) Set external attenuator for straight-through operation, i.e., no attenuation.

(3) Set voltmeter ATTENUATOR at 0db. Output meter should read 0 db.

(4) Attenuate the input signal in 1-db steps 0 db, recording the output meter reading at step. All readings should be within ±0.2 dbm e actual attenuated input level.

(5) Increase attenuation to -15 db. Output r should read within ±0.5 dbm.

(6) Increase attenuation to -20 db. Output r should read within ±1.0 dbm.

t. MIXER I-F PRELIMINARY ADJUSTMENT. al adjustment procedures for the mixer i-f on are listed below:

(1) Set FUNCTION to SEL 2500~.

(2) Set ATTENUATOR at 0 db.

(3) Set CAL 2 fully clockwise.

(4) Connect a jumper from binding post J1 e output arm of S2c.

(5) Feed a 2.215-mc signal from an external r-f source to the input of the voltmeter at a l which will give half-scale deflection of the ut meter.

(6) Tune L3, L4 and L5 progressively maximum meter indication. Reduce input signal as required to maintain half-scale indication.

g. LOCAL OSCILLATOR ADJUSTMENT. owing a fifteen-minute warm-up period, track local oscillator in the following manner:

(1) Set FUNCTION to SEL 2500~.

(2) Set ATTENUATOR at 0 db.

(3) Place 3-kc tuning dial mark on indr hairline. 5-kc

(4) Set FINE tuning control at midpoint.

(5) At 0-db level, feed 3-kc signal to voltter, and tune L11 for maximum meter deflection. 5 KC L20

(6) At 0-db level, feed 620-kc signal to meter, and tune C63 for maximum meter dection.

(7) Repeat steps (5) and (6) as needed to upper and lower frequency extremes.

(8) Should the 150-kc to 450-kc segment track within 0.5 kc, bend the serrated plates C62 to improve tracking to specified tolerance 5 kc).

(9) Repeat steps (3) to (8) for HF Scale

2

h. MODULATOR ADJUSTMENT. Balanced modulator adjustment requires an oscilloscope; procedure is described below:

(1) Turn instrument on; allow fifteen minutes for circuit to stabilize.

(2) Set FUNCTION to SEL 2500~.

(3) Remove modulator cover, and with the oscilloscope read the r-f envelope amplitude alternately at C66 and C67, adjusting R100 until the two amplitudes are equal.

(4) Replace the modulator cover, set the frequency dial at 3 kc, leaving FUNCTION set at SEL 2500~.

(5) Tune C66, C67, C68, and C69 for minimum signal indication, correcting each interaction until the residual output meter reading is as low as obtainable. Spurious harmonic generation should be at least 63 db down. Tune the frequency dial to 5 kc; residual reading should not exceed -20 db. A non-metallic screwdriver must be used in this procedure.

NOTE

The meter reading during this operation is not affected by the attenuator. Detected voltage is due to local oscillator feedthrough.

i. INJECTION OSCILLATOR OUTPUT. No provision is made for adjustment of the injection oscillator frequency. It may be desired, however, to check the frequency to see that it remains within the specified tolerance. Measured frequency at TP9, using an accurate counter or frequency meter, should be 100 kc ±0.02 percent.

j. The injection oscillator r-f output level is set in the following manner after checking the Flat Voltmeter adjustment (paragraph 1d).

(1) Set FUNCTION to CAL 1.

(2) Set ATTENUATOR to 0 db.

(3) Adjust R87 for an output meter reading of 0 dbm.

k. MIXER I-F FINAL TUNING. Final adjustment of the mixer i-f section is described below:

(1) Set FUNCTION to SEL 250~.

(2) Set ATTENUATOR to 0 db.

(3) Set CAL 2 at mid-position.

(4) Feed a 100-kc signal at 0-db level to the input of the voltmeter.

(5) Tune voltmeter to the input signal, and peak output meter indication with the FINE tuning control.

(6) Tune L3, L4 and L5 for maximum output meter deflection.

l. CAL 2 RANGE. With a 0-db input signal and CAL 2 control set fully clockwise, output meter should read at least +3 db. Turning the CAL 2 control fully counterclockwise should bring the reading down to at least -3 db.

m. 2500 CYCLE BANDWIDTH CHECK. Although the 2500~ and 250~ crystal filters are not adjustable, a complete calibration procedure should include a check of filter response. A method of determining bandwidth is described below:

(1) Set ATTENUATOR to 0 db.

(2) Set FUNCTION to SEL 2500~.

(3) Apply 0-db signal at 10 kc to input of voltmeter.

(4) Tune voltmeter to incoming signal, and adjust CAL 2 for 0-db output meter indication.

(5) Increase input signal frequency from 10 kc until output meter indication decreases 0.2 db. Record frequency.

(6) Decrease input signal frequency from 10 kc until output meter indication decreases 0.2 db. Record frequency. The sum of the differences in frequency obtained in steps (5) and (6) is the nose width of the response curve at 2500 cycles and should be approximately 1.0 kc. Using similar technique, 3-db bandwidth should be 2.5 kc, and 60-db skirt width should be about 14 kc.

n. 250 CYCLE BANDWIDTH CHECK. Using the method described in paragraph 1(m), bandwidth at the 0.2-db points of the 250 cycle filter curve should be 75 cycles, the 3-db points should be 250 cycles, and the 60-db points about 1400 cycles.

o. FILTER OUTPUT LEVEL MATCHING. To ensure proper input level to the i-f strip, the crystal filter outputs are balanced in the following manner:

(1) Set FUNCTION to SEL 250~.

(2) Feed a 100-kc, 0-db signal to voltmeter input binding post. Tune carefully for maximum output meter deflection. Record meter reading.

(3) Set FUNCTION to SEL 2500~.

(4) Retune for maximum meter deflection. If reading varies from that recorded in the SEL 250~ position, adjust R42 so that output indications are equal at 2500 cycles, and 250 cycles.

p. ATTENUATOR STEP CHECK. The attenuator is checked using a signal generator, an external decade attenuator and an a-c VTVM accurate to 1 percent. Procedure follows:

(1) Set ATTENUATOR at +20 db.

(2) Set FUNCTION at SEL 250~.

(3) Set LINE IMPEDANCE at 600ΩBRG.

(4) Apply a 20-kc signal at 20-db level to voltmeter; binding posts in unbalanced connection.

(5) Switch ATTENUATOR to +30 db. Output meter should read -10 db.

(6) Attenuate input signal 10 db using decade attenuator, and switch voltmeter ATTENUATOR to +10 db. Output meter should read 0 db ±0.2 db.

(7) Attenuate input signal in 10-db steps while increasing voltmeter sensitivity in 10-db steps to -70 db. Output meter should remain accurate to ±0.2 db.

(8) Repeat steps (1) through (7) using a 620-kc signal.

q. SELECTIVE VOLTMETER RESPONSE. Using a signal generator, and an a-c VTVM, determine voltmeter linearity in selective operation using the following procedure:

(1) Set FUNCTION to SEL 250~.

(2) Set ATTENUATOR at 0 db.

(3) Apply 100-kc signal to voltmeter at 0 db.

(4) Tune and peak voltmeter to incoming signal.

(5) Adjust CAL 2 for 0 db on output meter.

(6) At 3 kc, 10 kc, 50 kc, 200 kc, 300 kc, 400 kc, 500 kc, and 620 kc, all at 0 db input level,

l output meter readings. All readings should b, 0.5 db.

INTERMODULATION MEASUREMENT. encies of 72.5 kc and 100 kc at 0-db level d to the voltmeter input through a mixing pad ermine intermodulation characteristics of ltmeter. Proceed in the following manner:

(1) Set FUNCTION at SEL 2500~.

(2) Set ATTENUATOR at 0 db.

(3) Apply mixed frequencies to voltmeter.

(4) Adjust CAL 2 for 0 db output meter in- on. Do not disturb CAL 2 or input signal ators for remainder of the test.

(5) Tune the voltmeter to the following encies; with ATTENUATOR at -60 db:

172.5 kc	245.0 kc
27.5 kc	127.5 kc
45.0 kc	272.5 kc

e are all sums or differences of the two input encies, and should measure less than -60 db e output meter.

. NOISE LEVEL. Normal noise in the in- ent in SEL 2500~ position is about -20 db CAL 2 fully clockwise. Most circuit noise is ated in the mixer stage and cannot be elimi- nated without deteriorating mixer performance. Noise may be read directly on the output meter.

2. MAINTENANCE.

a. TROUBLE SHOOTING. Malfunctions can usually be determined rapidly using a sectionalizing system in conjunction with references to the equipment block diagram. First determine the correct operation of the power supply, checking the output voltage and ripple content. Excessive ripple and noise are due to power supply or decoupling network failure. Second, determine that the flat voltmeter operates correctly, since all other circuitry depends on its operation. Then approach the injection oscillator, mixer, i-f, and local oscillator sections. Occasionally coupling or decoupling capacitors leak only under conditions of high ambient temperature, and removal of the equipment from its cabinet may cause the fault to disappear. Microphoncis are usually caused by poor switch contacts, loose solder joints or defective tubes. For resistance and voltage measurement, refer to tables 3-2 and 3-3. For trouble-shooting tips see table 3-1.

b. Care should be exercised in working on printed circuit boards. Remember that excessive heat will destroy the board and its circuitry. Use only enough heat, using some form of heat sink, to remove the component. Re-mount all components close to the board to avoid mechanical strain on leads.

TABLE 3-1. TROUBLE SHOOTING TIPS

TROUBLE	PROBABLE CAUSE	REMEDY
Power, panel witch "ON"	1. No line voltage. 2. Defective power cord. 3. Fuse F1 blown.	1. Check line voltage. 2. Replace cord. 3. Determine cause, replace fuse.
use F1 Blown	1. Burned out diode in power supply. 2. Short in d-c supply. 3. Short in filament supply.	1. Replace diodes. 2. Determine cause, repair. 3. Determine cause, repair.
o meter reading CAL 1 position	1. Injection oscillator failure. 2. Flat amplifier failure. 3. Power supply failure.	1. Check V9, Y1, replace if necessary. 2. Check V5, V6, V7, CR1, CR2, replace if necessary. 3. Check V11, V12, replace if necessary.

TABLE 3-1. (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
No meter reading in CAL 1 position (Cont)	4. Function switch failure. 5. Wiring failure.	4. Check wafers contacts. Repair or replace. 5. Check osc. shielded output lead for short or open circuit.
No meter reading in CAL 2 position (CAL 1 functions properly) or No meter reading in SEL 2500~ and SEL 250~	1. Local oscillator failure. 2. Mixer failure. 3. I-F failure. 4. Function switch failure.	1. Check V10, CR4, CR5, CR6, replace if necessary. 2. Check V1, V2, replace if necessary. 3. Check V3, V4, replace if necessary. 4. Check wafers contacts, repair or replace.
Unable to set 0 db in CAL 2 position	1. Local oscillator output low. 2. Detuned circuit in mixer or I-F stages. 3. Low overall gain. 4. Injection oscillator output low.	1. Check CR4, CR5, CR6, replace if necessary. 2. Retune L3, L4, L5. 3. Check V1 through V7 and replace if necessary. 4. Check V9, Y1, replace if necessary.
Excessive "no signal" meter indication	1. Faulty modulator. 2. Detuned modulator. 3. Loose oscillator or modulator cover.	1. Check, replace CR4, CR5, CR6 if required (CR4, CR5 are a matched pair replacement). 2. Retune modulator. 3. Tighten cover.
Non linear output meter response	1. Defective meter diodes. 2. Defective meter.	1. Check or replace CR1, CR2. 2. Check or replace meter.
Unable to tune incoming signal (instrument operates correctly in CAL 2)	1. Open input circuit. 2. Defective bridging transformer. 3. Faulty LINE IMPEDANCE selector. 4. Faulty FUNCTION selector.	1. Check binding post and associated wiring. 2. Check or replace transformer. 3. Check contacts, repair or replace. 4. Check contacts, repair or replace.

TABLE 3-1. (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
ency Tuning Error	1. Local oscillator not tracking properly. 2. Loose local oscillator drum or variable capacitor coupling. 3. Local oscillator shift in frequency range.	1. Check and adjust per paragraph 1g. 2. Check and repair. 3. Defective L11, C63, C64, C65.
al readings in 2500~ and 250~	1. Filter output levels not matched. 2. Defective filter, excessive loss.	1. Adjust R42. 2. Replace FL1 or FL2.
al reading in 250~ and CAL 2 proper calibration)	1. Loss of regulation in power supply.	1. Check or replace V11, V12, V13.
regulation of power y output	1. Line voltage too high or too low. 2. Defective tubes. 3. Open or leaky capacitor.	1. Check line voltage. 2. Check or replace V11, V12, V13. 3. Check or replace C80, C83, C82.
r supply delivers sive d-c output ge.	1. Regulator V13. 2. Amplifier V12.	1. Check or replace. 2. Check or replace.
r supply delivers w a d-c output ge	1. Series tube V11. 2. Diodes CR7 to CR10.	1. Check or replace. 2. Check or replace.
dio output	1. Audio amplifier V8. 2. Audio detector CR3. 3. Open audio control. 4. Defective phone jack.	1. Check or replace V8. 2. Check or replace CR3. 3. Check or replace R82. 4. Check or replace J4.

TABLE 3-2. RESISTANCE VALUES*

ST POINT		RESISTANCE IN OHMS	TEST POINT		RESISTANCE IN OHMS
Power Supply			Power Supply (Cont)		
3	1 and 2	inf.	T3	3 and 4	30K
3	7 and 8	inf.	T3	5	0.5 ohm Max.

rements made with 20K/ohms/voltmeter.

TABLE 3-2. RESISTANCE VALUES*

TEST POINT		RESISTANCE IN OHMS
Power Supply (Cont)		
T3	6	0
V11	pin 1	560K
V11	pin 3 (TP1)	30K
V12	pin 1	560K
V12	pin 2	560K
V12	pin 3	18K
V12	pin 6	560K
V12	pin 7	95K
V12	pin 8	22K
V13	pins 1, 5	95K
V13	pins 2, 4, 7	0
Mixer		
TP4		30K
TP6		250K
TP7		4.7K
TP8		inf.
Local Oscillator		
V10	pin 1	80K
V10	pin 2	100K
V10	pin 3	.3
Local Oscillator (Cont)		
V10	pin 6	30K
V10	pin 7	1 meg
V10	pin 8	1K
C57	(TP29)	30K
T2	1	4.6
T2	3	0
Modulator		
TP31		4700
T2	1	4.6
T2	3 and 5	0
T2	4	45
T2	6	45
I-F Amplifier		
TP13		2.2K
TP14		30K approx.
TP15		.11
TP16		.11
TP18		0 to 2.5K
TP19		30K approx.
TP20		.11

TABLE 3-3. VOLTAGE REFERENCE CHART*

TP NO. OR LOCATION	VOLTAGE
Power Supply	
TP1	225 vdc + .25% (105 to 125 vac)
TP2 & TP3	6.3 vac across terminals
V11 pin 5	350 vdc
V12 pin 1	210 vdc
V12 pins 2, 6	130 vdc
V12 pin 3	132 vdc
Power Supply (Cont)	
V12 pin 8	86 vdc
V13 pins 1, 5	87 vdc
Mixer-Cathode Follower	
TP4	225 vdc
TP5	6.3 vac
TP6	variable rms
TP7	34 vdc

*Measurements made with 20K/ohms/voltmeter.

TABLE 3-3. VOLTAGE REFERENCE CHART* (Continued)

P NO. OR OCATION	VOLTAGE
Mixer-Cathode Follower (Cont)	
1 pin 5	198 vdc
1 pin 6	145 vdc
2 pin 2	2.4 vdc
2 pins 5, 6 & 7	47 vdc
I-F Amplifier	
P13	variable rms
P14	225 vdc
P16	variable rms
P19	225 vdc
P20	variable rms
3 pin 2	.5 vdc
3 pin 5	74 vdc
3 pin 6	40 vdc
4 pin 2	9.1 vdc R55 at
4 pin 5	156 vdc max. re-
4 pin 6	120 vdc sistance
surements made with 20K/ohms/voltmeter.	

TP NO. OR LOCATION	VOLTAGE
Flat Amplifier	
V5 pins 2, 7	0.6 vdc
V5 pin 5	131 vdc
V5 pin 6	62 vdc
V6 pins 2, 7	1 vdc
V6 pin 5	200 vdc
V6 pin 6	100 vdc
V7 pins 2, 7	1.0 vdc
V7 pin 5	155 vdc
V7 pin 6	100 vdc
TP25, TP26	154 vdc
Injection Oscillator	
TP10	225 vdc
V9 pin 3	.9 vdc
V9 pin 6	62 vdc
V9 pin 8	12 vdc

CALIBRATION AND MAINTENANCE ADDENDUM

CARRIER REINSERTION OSCILLATOR ADJUSTMENT. (Model 125B-CR only) Allow fifteen minutes for warmup. When circuits have stabilized, proceed as follows:

(1) Set FUNCTION switch to SEL. 2500 ∽.

(2) Set ATTENUATOR to 0.

(3) Set LINE IMPEDANCE to 600Ω BRG.

(4) Set AUDIO selector switch to AM.

(5) Plug headset into PHONES jack.

(6) Connect a low distortion r-f signal generator to input binding posts.

(7) Set signal generator for 0 db output at 100 kc, unmodulated.

(8) Adjust frequency dial of voltmeter to incoming frequency.

(9) Adjust CAL. 2 for a 0 db meter reading.

(10) Detune voltmeter to lower frequency side of signal to a nominal meter reading of -10 db.

(11) Switch AUDIO selector to LS and adjust C101 for zero beat, as heard in headset. (If zero beat cannot be obtained at -10 db, any point between -12 and -8 db is acceptable.)

(12) Detune voltmeter to higher frequency side of signal for a nominal meter reading of -10 db.

(13) Switch AUDIO selector switch to US and adjust C102 for zero beat as in step (11).

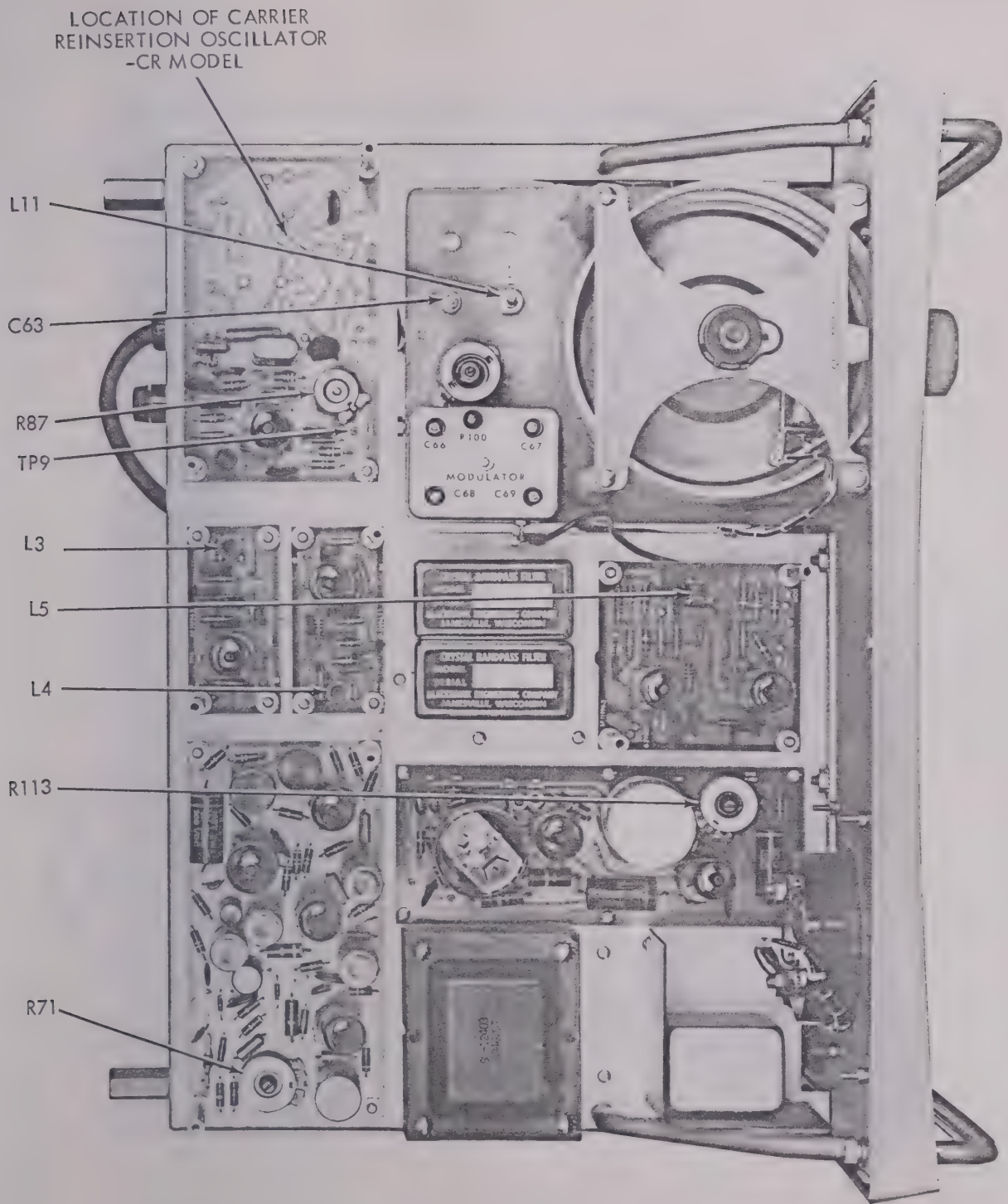


Figure 3-1. Model 125B, Top View

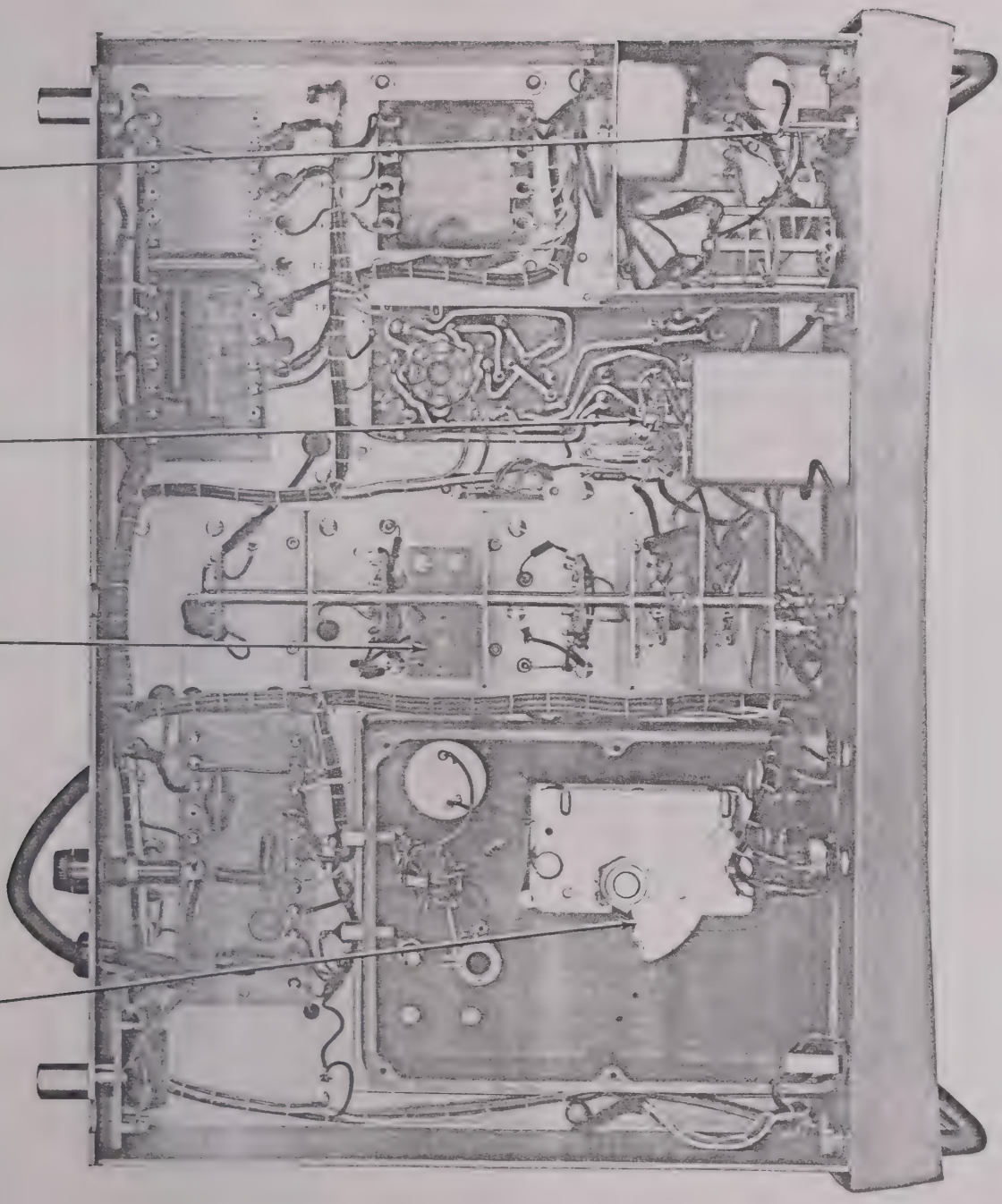


Figure 3-2. Model 125B, Bottom View

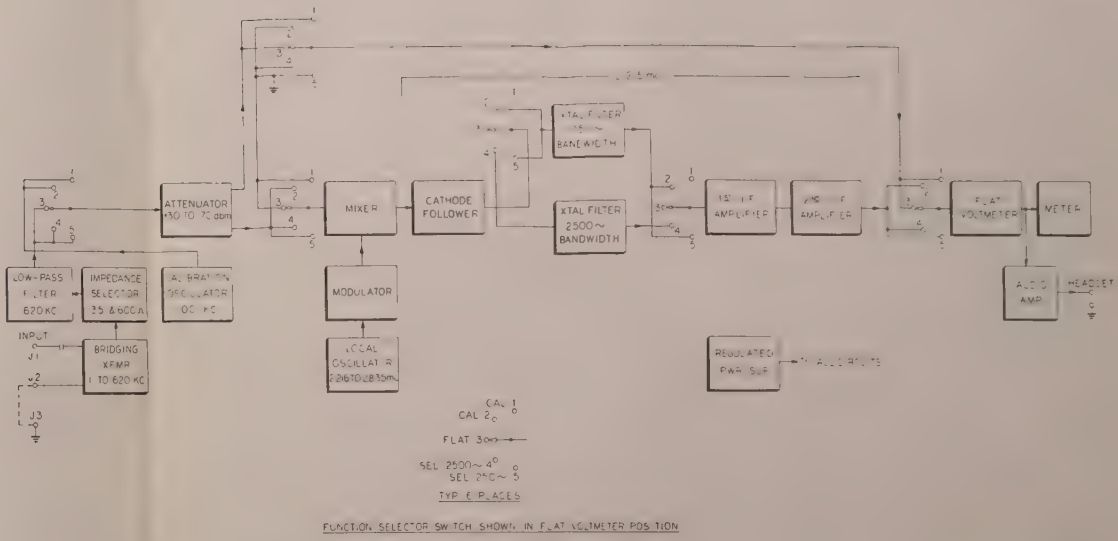
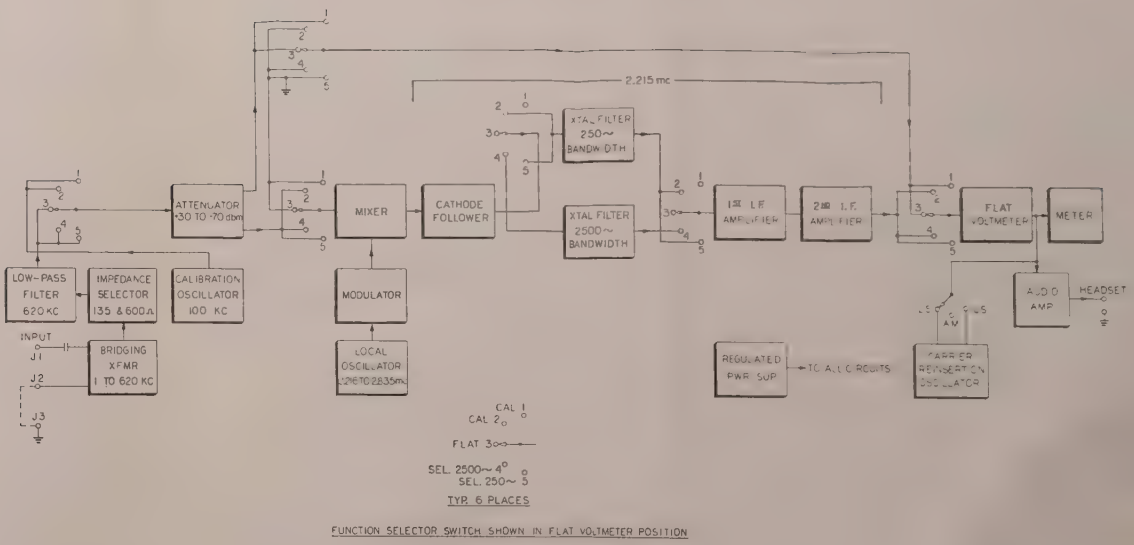


Figure 2-1. Model 125B
Functional Block Diagram



FUNCTION SELECTOR SWITCH SHOWN IN FLAT VOLTMETER POSITION

Figure 2-2. Model 125B-CR Functional Block Diagram

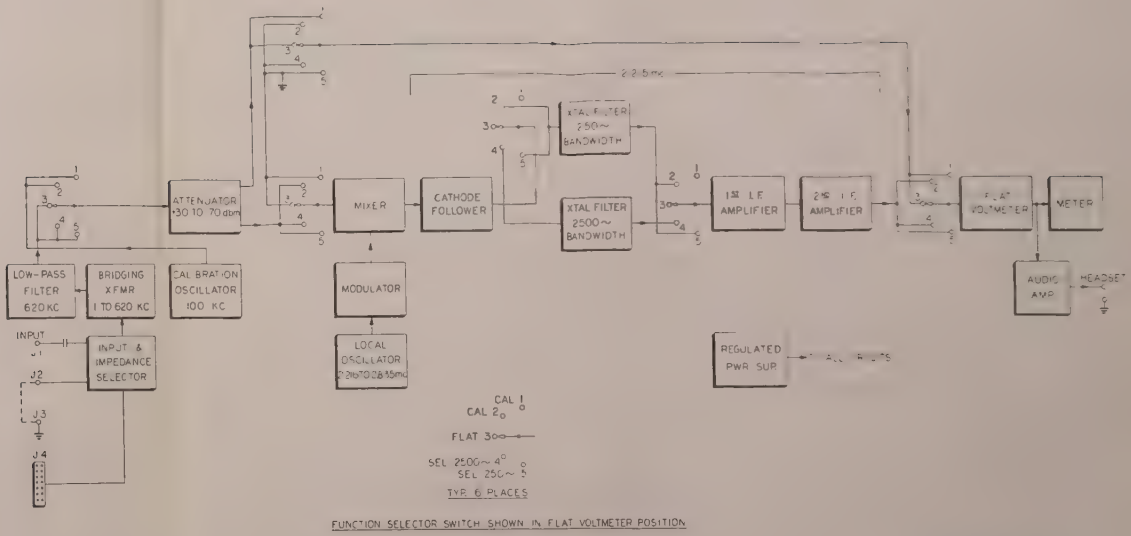


Figure 2-3. Model 125B-Y
Functional Block Diagram

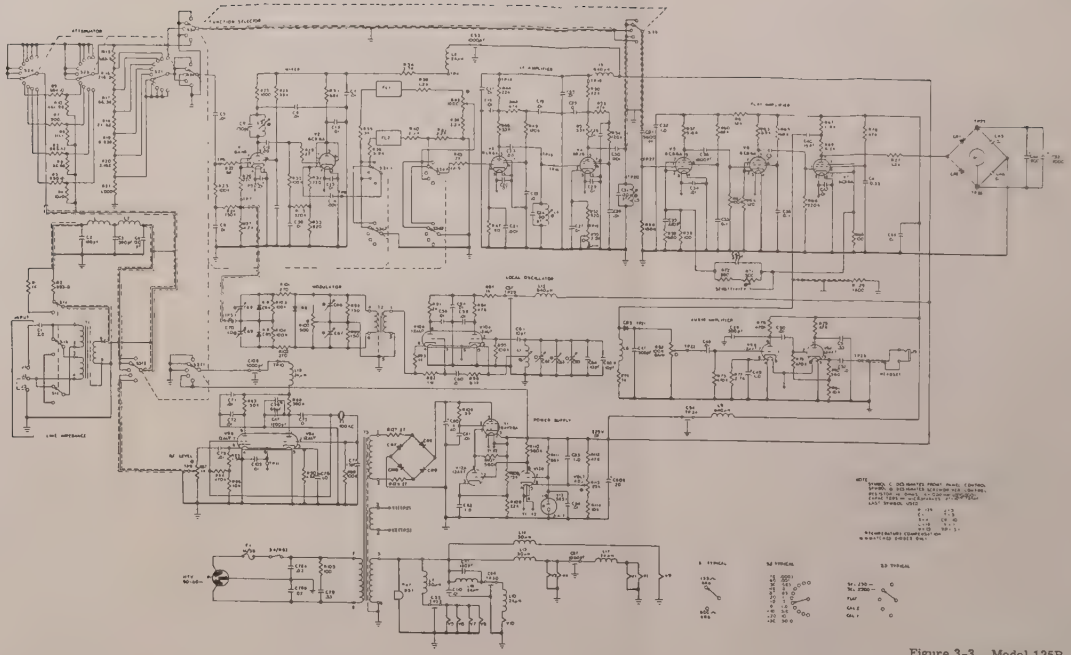


Figure 3-3. Model 125B
Schematic Diagram

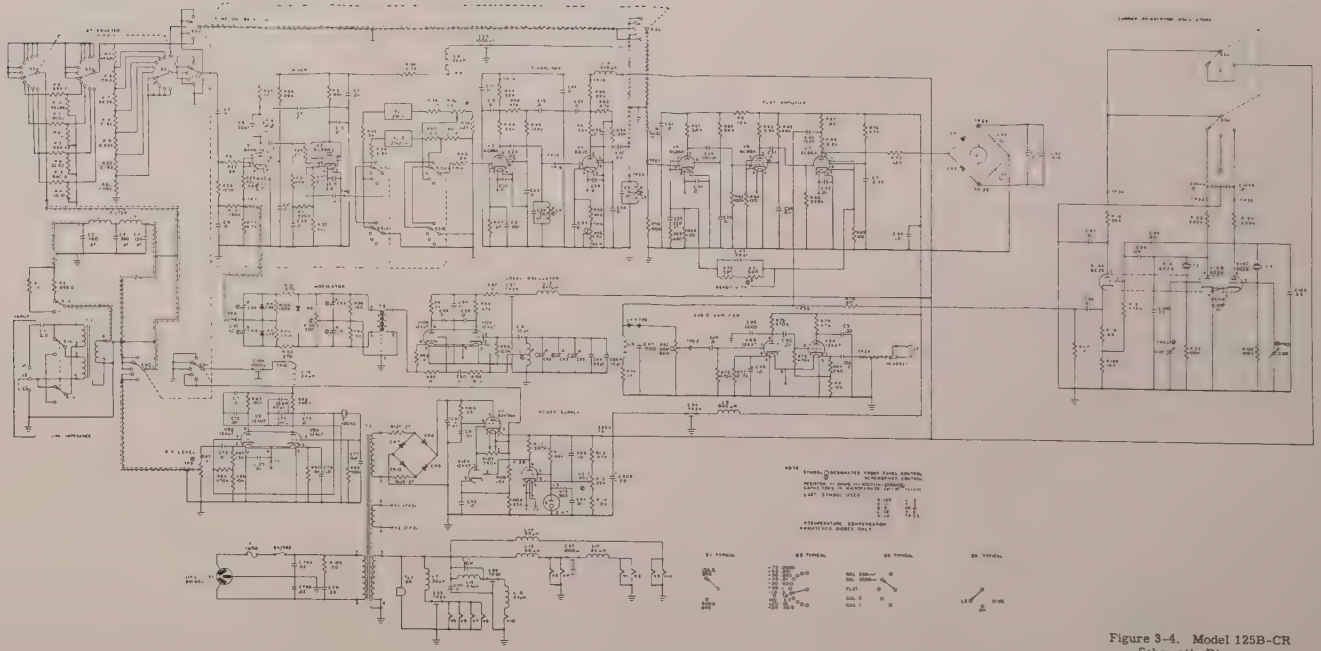


Figure 3-4. Model 125B-CR
Schematic Diagram

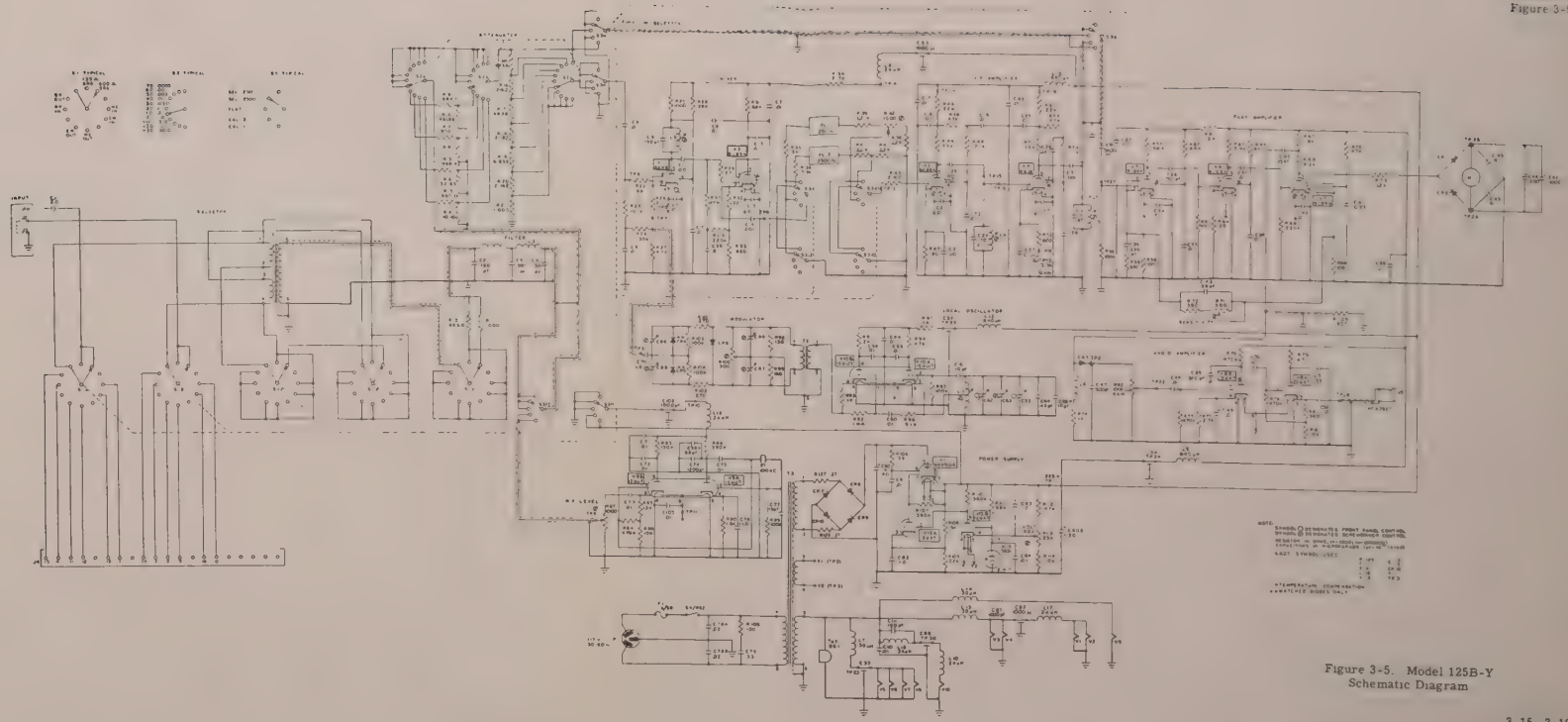


Figure 3-5. Model 125B-Y
Schematic Diagram

SECTION IV
REPLACEABLE PARTS

1. INTRODUCTION.

a. The following pages list the replaceable parts for Models 125B, 125B-CR and 125B-Y. Those components used only in Models 125B 125B-CR or 125B-Y are so designated by using a -B, -CR or -Y callout.

2. TABULAR LISTING.

TABLE 4-1. REPLACEABLE PARTS

Schem. Ref. or Item No.	Description	Sierra No.
C1	CAPACITOR, 2.0 mf, 400 vdcw, Metalized Paper	902420205
C2	CAPACITOR, 180 pf, 500 vdcw ±2%, Silver Mica	902070181
C3	CAPACITOR, 390 pf, 300 vdcw ±2%, Silver Mica	902070391
C4	CAPACITOR, 130 pf, 500 vdcw ±2%, Silver Mica	902070131
C5	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C6	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C7	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C8	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C9	CAPACITOR, 130 pf, 500 vdcw ±2%, Silver Mica	902070131
C10	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C11	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C12	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C13	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C14	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C15	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C16	NOT USED	
C17	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C18	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C19	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C20	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C21	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C22	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C23	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C24	CAPACITOR, 130 pf, 500 vdcw ±2%, Silver Mica	902070131
C25	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
C26	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C27	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C28	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C29	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C30	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C31	CAPACITOR, 130 pf, 500 vdcw ±2%, Silver Mica	902070131
C32	CAPACITOR, 1.0 mf, 350 vdcw, Paper PC SS-13259-1	901140105
C33	CAPACITOR, .1 mf, 400 vdcw, Paper	901000001
C34	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C35	CAPACITOR, 220 pf, 300 vdcw ±2%, Silver Mica	902070221
C36	CAPACITOR, 1000 pf, 500 vdcw ±5%, Dur-Mica	902000102
C37	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C38	CAPACITOR, .1 mf, 400 vdcw, Paper	901000001
C39	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C40	CAPACITOR, 15 pf, 500 vdcw, ±5% Silver Mica	902010150
C41	CAPACITOR, .33 mf, 400 vdcw, Paper Tubular	901010334
C42	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C43	CAPACITOR, 39 pf, 500 vdcw ±2%, Silver Mica	902070390
C44	CAPACITOR, 200 mf, 6 vdcw, Electrolytic	902210207
C45	CAPACITOR, .1 mf, 400 vdcw, Paper	901000001
C46	CAPACITOR, .1 mf, 400 vdcw, Paper	901000001
C47	CAPACITOR, 500 pf, 1000 vdcw, ±2% Disc Ceramic	901410501
C48	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C49	CAPACITOR, 1.0 mf, 50 vdcw, Electrolytic	902220105
C50	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C51	CAPACITOR, .33 mf, 400 vdcw, Paper Tubular	901010334
C52	CAPACITOR, 1.0 mf, 200 vdcw, Metalized Paper	902410105
C53	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C54	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C55	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C56	CAPACITOR, 68 pf, 1200 vdcw ±2%, N330	901410680
C57	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C58	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C59	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C60	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C61	CAPACITOR, 10 pf ±2%, NPO Tubular Hi Kap	901420100
C62	CAPACITOR, 10-55.7 pf, variable	902810555

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
C63	CAPACITOR, 0.7-12 pf, NPO Glass Trimmer	903000120
C64	CAPACITOR, 43 pf ±2%, NPO Tubular Hi Kap	901410430
C65	CAPACITOR, 10 pf ±2%, N330 Tubular Hi Kap	901410100
C66	CAPACITOR, 0.7-12 pf, NPO Glass Trimmer	903000120
C67	CAPACITOR, 0.7-12 pf, NPO Glass Trimmer	903000120
C68	CAPACITOR, 0.7-12 pf, NPO Glass Trimmer	903000120
C69	CAPACITOR, 0.7-12 pf, NPO Glass Trimmer	903000120
C70	CAPACITOR, 1.0 mf, 200 vdcw, Metalized Paper	902410105
C71	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C72	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C73	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C74	CAPACITOR, 1200 pf, 500 vdcw ±2%, Silver Mica	902070122
C75	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C76	CAPACITOR, 1.0 mf, 50 vdcw, Electrolytic	902220105
C77	CAPACITOR, 15 pf, 500 vdcw ±2%, Silver Mica	902070150
C78	CAPACITOR, 2X.02 mf, 500 vdcw, Disc Ceramic	901450103
C79	CAPACITOR, .33 mf, 400 vdcw, Metalized Paper	902410334
C80	CAPACITOR, 40-20 mf, 450 vdcw, Electrolytic	902210402
C81	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C82	CAPACITOR, 1.0 mf, 200 vdcw, Metalized Paper	902410105
C83	CAPACITOR, 1.0 mf, 200 vdcw, Metalized Paper	902410105
C84	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C85	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C86	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C87	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C88	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C89	CAPACITOR, 500 pf, 1000 vdcw, ±2% Disc Ceramic	901410501
C90	Not Used	
C91	CAPACITOR, 5600 pf, 600 vdcw ±10%, Paper Mylar Sidelead	901100562
C92	CAPACITOR, 1000 mf, 6 vdcw, Electrolytic 85° C	902230108
C93	CAPACITOR, Variable	142171000
C94	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C95	Not Used	
C96-CR	CAPACITOR, .01 mf, 150 vdcw, Disc Ceramic	901440103
C96-Y	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C97-CR	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
C97-Y	CAPACITOR, .01mf, 450 vdcw, Disc Ceramic	901400103
C98-CR	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C98-Y	CAPACITOR, 180 pf, 500 vdcw ±2%, Silver Mica	902080181
C99-CR	CAPACITOR, .001 mf, 500 vdcw, Disc Ceramic	901400102
C100-CR	CAPACITOR, 33 pf, 500 vdcw, ±2%, Silver Mica	902070330
C101-CR	CAPACITOR, 5-25 pf	903200250
C102-CR	CAPACITOR, 5-25 pf	903200250
C103-CR	CAPACITOR, 33 pf, 500 vdcw, ±2%, Silver Mica	902070330
C104-CR	CAPACITOR, 2X .01 mf	901450103
C105	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C106	Not Used	
C107	Not Used	
C108	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C108-CR	CAPACITOR, 1000 pf, 500 vdcw, Ceramic Feed-thru	902630102
C109	Not Used	
C110	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C110-CR	CAPACITOR, .01 mf, 450 vdcw, Disc Ceramic	901400103
C111	CAPACITOR, 180 pf, 500 vdcw ±2%, Silver Mica	902070181
C111-CR	CAPACITOR, 180 pf, 500 vdcw ±2%, Silver Mica	902070181
CR1	DIODE, S10G Silicon	910500010
CR2	DIODE, S10G Silicon	910500010
CR3	DIODE, 1N34A Germanium	910500034
CR4	DIODE, MP3507, Matched Pair, Silicon	910500009
CR5	DIODE, MP3507, Matched Pair, Silicon	910500009
CR6	DIODE, 1N34A Germanium	910500034
CR7	RECTIFIER, 600 PIV 750 ma	910800008
CR8	RECTIFIER, 600 PIV 750 ma	910800008
CR9	RECTIFIER, 600 PIV 750 ma	910800008
CR10	RECTIFIER, 600 PIV 750 ma	910800008
DS1	PILOT LIGHT, Bayonet Base	913800001
F1	FUSE, 1.0 Amp. Delay	913200007
FL1	CRYSTAL FILTER, 2.215 mc, 250 Cycle Bandpass	910100004
FL2	CRYSTAL FILTER, 2.215 mc, 2500 Cycle Bandpass	910100005
J1	BINDING POST, Insulated	915200003
J2	BINDING POST, Insulated	915200003

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
J3	BINDING POST, Grounding	915200004
J4-Y	CONNECTOR	914800003
J5	JACK, Telephone	914400003
L1	INDUCTOR, 340 Microhenries	909000104
L2	INDUCTOR, 340 Microhenries	909000104
L3	INDUCTOR, 64-105 Microhenries, Variable	909400039
L4	INDUCTOR, 64-105 Microhenries, Variable	909400039
L5	INDUCTOR, 64-105 Microhenries, Variable	909400039
L6	INDUCTOR, 100 Microhenries	909000098
L7	INDUCTOR, 30 Microhenries, 1.5 Amp	909000096
L8	INDUCTOR, 24 Microhenries, 300 Ma	909000097
L9	INDUCTOR, 640 Microhenries	909000015
L10	INDUCTOR, 24 Microhenries, 300 Ma	909000097
L11	INDUCTOR, 20-41 Microhenries	909400038
L12	INDUCTOR, 640 Microhenries	909000015
L13	INDUCTOR, 30 Microhenries, 1.5 Amp	909000096
L14	INDUCTOR, 24 Microhenries, 300 Ma	909000097
L14-CR	INDUCTOR, 30 Microhenries, 1.5 Amp	909000096
L15	INDUCTOR, 640 Microhenries	909000015
L16	INDUCTOR, 24 Microhenries, 300 Ma	909000097
L17	INDUCTOR, 24 Microhenries, 300 Ma	909000097
L18	INDUCTOR, 24 Microhenries, 300 Ma	909000097
M1	METER, 0 - 1.0 ma dc Special Scale for Silicon Diode S10G	911800045
R1	RESISTOR 1000 ohm 1%, 1/2 W Deposited Carbon	907400080
R2	RESISTOR, 893.0 ohm ±1%, 1/2W Deposited Carbon	907400081
R3	RESISTOR, 990.01 ohm ±1%, 1/2W Deposited Carbon	907400093
R4	RESISTOR, 10.10 ohm ±1%, 1/2W Deposited Carbon	907400100
R5	RESISTOR, 968.42 ohm ±1%, 1/2W Deposited Carbon	907400094
R6	RESISTOR, 32.65 ohm ±1%, 1/2W Deposited Carbon	907400096
R7	RESISTOR, 900.1 ohm ±1%, 1/2W Deposited Carbon	907400095
R8	RESISTOR, 111.11 ohm ±1%, 1/2W Deposited Carbon	907400097
R9	RESISTOR, 684.0 ohm ±1%, 1/2W Deposited Carbon	907400098
R10	RESISTOR, 461.98 ohm ±1%, 1/2W Deposited Carbon	907400099
R11, R12	Not Used	
R13, R14	Not Used	
R15	RESISTOR, 683.8 ohm ±1%, 1/2W Deposited Carbon	907400022
R16	RESISTOR, 216.2 ohm ±1%, 1/2W Deposited Carbon	907400020

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
R17	RESISTOR, 68.38 ohm ±1%, 1/2W Deposited Carbon	907400018
R18	RESISTOR, 21.62 ohm ±1%, 1/2W Deposited Carbon	907400017
R19	RESISTOR, 6.838 ohm ±1%, 1/2W Deposited Carbon	907400089
R20	RESISTOR, 2.162 ohm ±1%, 1/2W Deposited Carbon	907400090
R21	RESISTOR, 1.000 ohm ±1%, 1/2W Deposited Carbon	907400091
R22	RESISTOR, 68 ohm ±10%, 1/2W Fixed Composition	905200680
R23	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R24	RESISTOR, 150,000 ohm ±10%, 1/2W Fixed Composition	905200154
R25	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Composition	905000102
R26	RESISTOR, 220 ohm ±5%, 1/2W Fixed Composition	905000221
R27	RESISTOR, 4700 ohm ±5%, 1/2W Fixed Composition	905000472
R28	RESISTOR, 39,000 ohm ±5%, 1/2W Fixed Composition	905000393
R29	RESISTOR, 27 ohm ±10%, 1/2W Fixed Composition	905200270
R30	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R31	RESISTOR, 68,000 ohm ±10%, 1/2W Fixed Composition	905200683
R32	RESISTOR, 220 ohm ±5%, 1/2W Fixed Composition	905000221
R33	RESISTOR, 820 ohm ±5%, 1/2W Fixed Composition	905000821
R34	RESISTOR, 2,700 ohm ±5%, 1/2W Fixed Composition	905000272
R35	RESISTOR, 3,000 ohm ±5%, 1/2W Fixed Composition	905000302
R36	RESISTOR, 3,900 ohm ±5%, 1/2W Fixed Composition	905000392
R37	Not Used	
R38	RESISTOR, 2,200 ohm ±5%, 1/2W Fixed Composition	905000222
R39	RESISTOR, 1,200 ohm ±5%, 1/2W Fixed Composition	905000122
R40	RESISTOR, 2,200 ohm ±5%, 1/2W Fixed Composition	905000222
R41	RESISTOR, 2,200 ohm ±5%, 1/2W Fixed Composition	905000222
R42	POTENTIOMETER, 1,000 ohm Type UPE-70	907900105
R43	RESISTOR, 2000 ohm 5%, 1/2W Fixed Composition	905000202

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
R44	RESISTOR, 22,000 ohm ±10%, 1/2W Fixed Composition	905200223
R45	RESISTOR, Not Used	
R46	RESISTOR, 33,000 ohm ±10%, 1/2W Fixed Composition	905200333
R47	RESISTOR, 180 ohm ±5%, 1/2W Fixed Composition	905000181
R48	RESISTOR, 47,000 ohm ±10%, 1/2W Fixed Composition	905200473
R49	RESISTOR, 120,000 ohm ±10%, 1/2W Fixed Composition	905200124
R50	RESISTOR, 22,000 ohm ±10%, 1/2W Fixed Composition	905200223
R51	RESISTOR, 33,000 ohm ±10%, 1/2W Fixed Composition	905000333
R52	RESISTOR, 820 ohm ±5%, 1/2W Fixed Composition	905000821
R53	RESISTOR, 47,000 ohm ±10%, 1/2W Fixed Composition	905200473
R54	RESISTOR, 120,000 ohm ±10%, 1/2W Fixed Composition	905200124
R55	POTENTIOMETER, 2,500 ohm, 2W Composition	907900012
R56	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R57	RESISTOR, 5,600 ohm ±10%, 1/2W Fixed Composition	905200562
R58	RESISTOR, 100 ohm ±5%, 1/2W Fixed Composition	905000101
R59	RESISTOR, 680 ohm ±5%, 1/2W Fixed Composition	905000681
R60	RESISTOR, 68,000 ohm ±10%, 1/2W Fixed Composition	905200683
R61	RESISTOR, 12,000 ohm ±10%, 1/2W Fixed Composition	905200123
R62	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R63	RESISTOR, 3,900 ohm ±10%, 1W Fixed Composition	905600392
R64	RESISTOR, 120 ohm ±5%, 1/2W Fixed Composition	905000121
R65	RESISTOR, 68,000 ohm ±10%, 1/2W Fixed Composition	905200683
R66	RESISTOR, 220,000 ohm ±10%, 1/2W Fixed Composition	905200224
R67	RESISTOR, 1,800 ohm ±5%, 1/2W Fixed Composition	905000182
R68	RESISTOR, 8,200 ohm ±5%, 1W Fixed Composition	905400822
R69	RESISTOR, 100 ohm ±5%, 1/2W Fixed Composition	905000101
R70	RESISTOR, 47,000 ohm ±10%, 1/2W Fixed Composition	905200473
R71	POTENTIOMETER, 500 ohm, 1/2W, Taper 1	907900100
R72	RESISTOR, 390 ohm ±5%, 1/2W Fixed Composition	905000391
R73	RESISTOR, 1,200 ohm ±10%, 1/2W Fixed Composition	905200122
R74	RESISTOR, 1,000 ohm ±10%, 1/2W Fixed Composition	905200102

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
R75	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Composition	905200474
R76	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Composition	905200474
R77	RESISTOR, 2,700 ohm ±5%, 1/2W Fixed Composition	905000272
R78	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Composition	905200474
R79	RESISTOR, 47,000 ohm ±10%, 1/2W Fixed Composition	905200473
R80	RESISTOR, 560 ohm ±5%, 1/2W Fixed Composition	905000561
R81	RESISTOR, 10,000 ohm ±10%, 1/2W Fixed Composition	905200103
R82	POTENTIOMETER, 100,000 ohm, 2W Comp. Switch Section	907900071
R83	RESISTOR, 150,000 ohm ±5%, 1/2W Fixed Composition	905000154
R84	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Composition	905200474
R85	RESISTOR, 1,500 ohm ±5%, 1/2W Fixed Composition	905000152
R86	RESISTOR, 10,000 ohm ±10%, 1/2W Fixed Composition	905200103
R87	POTENTIOMETER, 1,000 ohm, Type UPE-70	907900105
R88	RESISTOR, 390,000 ohm ±5%, 1/2W Fixed Composition	905000394
R89	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R90	RESISTOR, 1,800 ohm ±5%, 1/2W Fixed Composition	905000182
R91	RESISTOR, 2,000 ohm ±5%, 1/2W Fixed Composition	905000202
R92	RESISTOR, 1 Megohm ±10%, 1/2W Fixed Composition	905200105
R93	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Composition	905000102
R94	RESISTOR, 47,000 ohm ±5%, 1/2W Fixed Composition	905000472
R95	RESISTOR, 100,000 ohm ±10%, 1/2W Fixed Composition	905200104
R96	RESISTOR, 9,100 ohm ±5%, 1/2W Fixed Composition	905000912
R97	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Composition	905000102
R98	RESISTOR, 150 ohm ±5%, 1/2W Fixed Composition	905000151
R99	RESISTOR, 150 ohm ±5%, 1/2W Fixed Composition	905000151
R100	POTENTIOMETER, 500 ohm 1/4W Composition (Lug Terminals)	907900102
R101	RESISTOR, 270 ohm ±5%, 1/2W Fixed Composition	905000271

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
R102	RESISTOR, 270 ohm ±5%, 1/2W Fixed Composition	905000271
R103	RESISTOR, 100,000 ohm ±5%, 1/2W Fixed Composition	905000104
R104	RESISTOR, 100,000 ohm ±5%, 1/2W Fixed Composition	905000104
R105	RESISTOR, 100 ohm ±10%, 1/2W Fixed Composition	905200101
R106	RESISTOR, 39 ohm ±10%, 1/2W Fixed Composition	905200390
R107	RESISTOR, 560,000 ohm ±5%, 1/2W Fixed Composition	905000564
R108	RESISTOR, 15,000 ohm ±5%, 2W Fixed Composition	905800153
R109	RESISTOR, 22,000 ohm ±5%, 2W Fixed Composition	905800223
R110	RESISTOR, 560,000 ohm ±5%, 1/2W Fixed Composition	905000564
R111	RESISTOR, 68,000 ohm ±5%, 1W Fixed Composition	905400683
R112	RESISTOR, 47,000 ohm ±5%, 1W Fixed Composition	905400473
R113	POTENTIOMETER, 25,000 ohm, Printed Circuit Type, Taper 1	907900103
R114	RESISTOR, 10,000 ohm ±5%, 1/2W Fixed Composition	905000103
R115	RESISTOR, 220,000 ohms ±10%, 1/2W Fixed Composition	905200224
R116-CR	RESISTOR, 820 ohm ±5%, 1/2W Fixed Composition	905000821
R117-CR	RESISTOR, 1,000 ohm ±5%, 1/2W Fixed Composition	905000102
R118-CR	RESISTOR, 56,000 ohm ±5%, 1/2W Fixed Composition	905000563
R119-CR	RESISTOR, 68 ohm ±5%, 1/2W Fixed Composition	905000680
R120-CR	RESISTOR, 10,000 ohm ±5%, 1/2W Fixed Composition	905000103
R121-CR	RESISTOR, 470,000 ohm ±10%, 1/2W Fixed Composition	905200104
R122-CR	RESISTOR, 100,000 ohm ±5%, 1/2W Fixed Composition	905000104
R123-CR	RESISTOR, 220,000 ohm ±5%, 1/2W Fixed Composition	905000224
R124-CR	RESISTOR, 220,000 ohm ±5%, 1/2W Fixed Composition	905000224
R125-CR	RESISTOR, 100,000 ohm ±5%, 1/2W Fixed Composition	905000104
R126	Not Used	
R127-CR	RESISTOR, 27 ohm ±5%, 1/2W Fixed Composition	905000270
R127-Y	RESISTOR, 27 ohm ±5%, 1/2W Fixed Composition	905000270
R128-CR	RESISTOR, 27 ohm ±5%, 1/2W Fixed Composition	905000270
R129-B	RESISTOR, 1,800 ohm ±5%, 1/2W Fixed Composition	905000182
R129-Y	RESISTOR, 1,800 ohm ±5%, 1/2W Fixed Composition	905000182
R129-CR	Not Used	

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description		Sierra No.
S1	SWITCH, Selector		911200059
S1-CR	SWITCH, Selector		911200059
S1-Y	SWITCH, Selector		911200057
S2	SWITCH, Selector, 3 pole, 11 Position, 4 Section		911200056
S3	SWITCH, Selector, 9 pole, 5 Position, 6 Section		911200046
S4	SWITCH, On-Off, (Part of R82 Potentiometer)		907900071
S5-CR	SWITCH, Selector, 2 pole, 3 Position, 1 Section		911200058
T1	TRANSFORMER, 600-135 ohm/2000 ohm 1 kc to 620 kc		141893000
T2	TRANSFORMER, 2:1 turns ratio, Frequency Range 2.2mc to 2.9 mc		123671000
T3	TRANSFORMER, Power, Sec. #1:268 Vrms at 75 ma; Sec. #2:6.3 Vrms at 3.5A Sec. #3:6.3A, Primary 117 Vrms 50/60 cps (Per SS-12403-1A)		910000033
V1	VACUUM TUBE, Sharp Cut-Off Pentode	6AH6	910700074
V2	VACUUM TUBE, Sharp Cut-Off Pentode	6CB6A	910700059
V3	VACUUM TUBE, Sharp Cut-Off Pentode	6CB6A	910700059
V4	VACUUM TUBE, Sharp Cut-Off Pentode	6BJ6	910700075
V5	VACUUM TUBE, Sharp Cut-Off Pentode	6CB6A	910700059
V6	VACUUM TUBE, Sharp Cut-Off Pentode	6CB6A	910700059
V7	VACUUM TUBE, Sharp Cut-Off Pentode	6CB6A	910700059
V8	VACUUM TUBE, Twin Triode	12AX7	910700069
V9	VACUUM TUBE, Twin Triode	12AU7	910700052
V10	VACUUM TUBE, Twin Triode	12AU7	910700052
V11	VACUUM TUBE, Pentode	6AV5GA	910700076
V12	VACUUM TUBE, Twin Triode	12AX7	910700069
V13	GAS TUBE, Voltage Reference	5651	910700015
V14-CR	VACUUM TUBE, Triple Triode	6EZ8	910700088
XDS1	PILOT LIGHT, Holder		914200008
XF1	FUSEHOLDER		913400001
XV1	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV2	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV3	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV4	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV5	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV6	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV7	TUBE SOCKET, 7 pin miniature for printed board		914000036
XV8	TUBE SOCKET, 9 pin Noval for printed board		914000037

TABLE 4-1. REPLACEABLE PARTS (Continued)

Schem. Ref. or Item No.	Description	Sierra No.
XV9	TUBE SOCKET, 9 pin Noval for printed board	914000037
XV10	TUBE SOCKET, Turret	914000032
XV11	TUBE SOCKET, Octal for printed board	914000035
XV12	TUBE SOCKET, 9 pin Noval for printed board	914000037
XV13	TUBE SOCKET, 7 pin miniature for printed board	914000036
XV14-CR	TUBE SOCKET, 9 pin Noval for printed board	914000037
XY1	CRYSTAL, Holder, Ceramic	914200021
XY2-CR	CRYSTAL, Holder, Ceramic	914200021
XY3-CR	CRYSTAL, Holder, Ceramic	914200021
Y1	CRYSTAL, Quartz 100 kc, .02%	912200009
Y2-CR	CRYSTAL, Quartz 2,213.5kc, .005%	911200011
Y3-CR	CRYSTAL, Quartz 2,216.5kc, .005%	911200012
-	SHORTING LINK	915200007

PARTS REPLACEMENT

To help in identifying and ordering replacement parts, the REPLACEMENT PARTS LIST contains the circuit symbol, commercial description and Sierra stock number.

To order parts from Sierra Electronic Division:

1. Give Sierra stock number of part to be ordered.
2. Give circuit symbol and commercial description of part to be ordered.
3. State name, model and serial number of the equipment containing part to be ordered.
4. Send order to:

SIERRA ELECTRONIC DIVISION
Philco Corporation
3885 Bohannon Drive
Menlo Park, California

For further service information on this unit, contact

SIERRA ELECTRONIC DIVISION
Philco Corporation
3885 Bohannon Drive
Menlo Park, California

Area Code 415

Telephone 326-2060

TWX 492-9224

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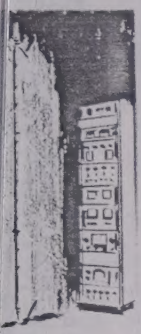

Communications and Weapons Division

4700 Wissahickon Ave., Phila., Pa.

An organization experienced in engineering, manufacturing, and support of advanced communications systems and devices, radar, missile guidance and fuzing, counter-measures, weapon systems, underwater systems and advanced programs.

Communications Systems Division

515 Pennsylvania Ave., Ft. Washington, Pa.

Planning, development, installation and management of command and control systems, communications, displays, data handling, and sensory systems for government and industry.

TechRep Division

C & Ontario Streets, Philadelphia, Pa.

A world-wide field engineering organization providing contract technical services in the fields of engineering, installation, maintenance, operation, technical training and technical publications.

Sierra Electronic Division

3885 Bohannon Drive, Menlo Park, Calif.

Development engineering and manufacturing of special purpose equipment and systems, including: communications and R.F. power test equipment, monitoring systems, R.F. power amplifiers and transmitters at all power levels and frequencies, navigational and telemetry systems.

Computer Division

3900 Welsh Road, Willow Grove, Pa.

Philco 2000 series of large-scale electronic data processing systems for military, government and scientific applications; and Basicpac mobile military computer systems.

Western Development Laboratories

3875 Fabian Way, Palo Alto, Calif.

System manager for space programs and ground support systems for space. Capabilities include system design and integration, complete vehicle systems and sub-systems, satellite control systems, range instrumentation systems, and other specialized space equipment.

Lansdale Division

Church Road, Lansdale, Pa.

A pioneer producer of germanium and silicon transistors, microwave diodes, IR detectors, microelectronic circuits and other solid state devices for switching and communications applications, high-speed semiconductor test equipment, and special purpose cathode ray tubes.

Scientific Laboratory

Union Meeting & Jolly Roads, Blue Bell, Pa.

Provides the basic and applied research support for the Corporation in all engineering and scientific disciplines. Main areas of investigation are: electronic materials and components; communications and detection; recognition, learning, and automation; mathematical physics.

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